

New species of Latest Jurassic and Earliest Cretaceous radiolarians from the Sorachi Group in Hokkaido, Japan.

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空知層群からのジュラ紀最新世・白亜紀最古世放射虫化石

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抄録：北海道中央部の幌加内地域に分布する空知層群からはジュラ紀最新世から白亜紀最古世にかけての放射虫化石群集を産出する。そのうちの4種（内2種は新種）を記載した。

Abstract: Well preserved Latest Jurassic and Earliest Cretaceous radiolarians occur from siliceous rocks of the Sorachi Group in Horokanai area, central Hokkaido. Among many species of radiolarians occurred, four species are remarked, and two of them are given descriptions as new species.

Key words: Radiolarian; Horokanai ophiolite; Sorachi Group; Late Jurassic; New species.

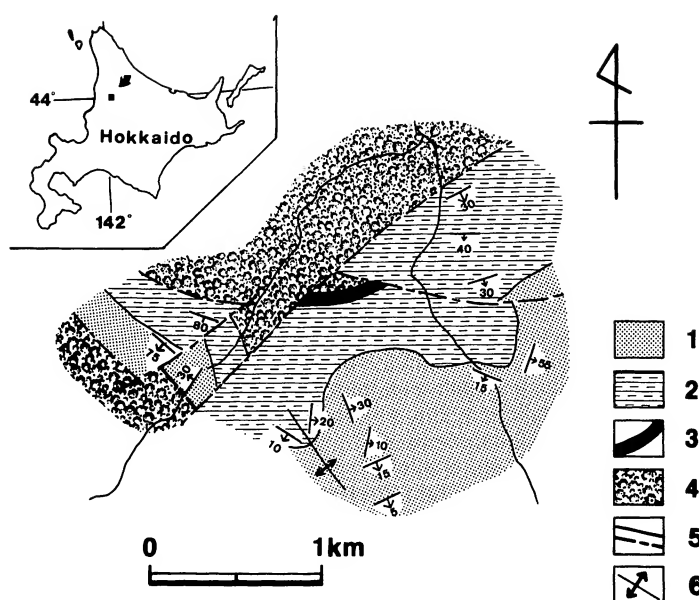
1. Introduction

In the Horokanai area, situated to the north of Asahikawa City, central Hokkaido, Japan, Jurassic-Cretaceous strata belonging to the Sorachi-Yezo Belt are widely distributed (Text-fig.1). They are called the Sorachi Group and the Yezo Group in ascending orders. The stratigraphy and age of the Sorachi Group have been clarified by many workers (cf. KAWAGUCHI, 1985, Teshio area; ISHIZUKA, 1980, KIMINAMI et al., 1987, Horokanai area; KITO, 1987, Furano area; KIMINAMI, et al., 1985b, Chiroro area). According to these studies, the Sorachi Group consists of greenstones and overlying clastic sedimentary rocks, which is conformably overlaid by the Yezo Group.

The author and co-workers studied lithostratigraphically and biostratigraphically on the Sorachi Group along the Inu-ushibetsu River, Horokanai area, and clarified the Group ranging in ages from Latest Jurassic to Earliest Cretaceous (KIMINAMI et al., 1987). In this paper, four species including two new species of radiolaria are described from the Sorachi Group.

2. Geological Setting

According to KIMINAMI et al. (1987), the Sorachi Group of investigated area consists of, from lower to upper, greenstones, cherts, and clastic sediments mainly of volcanogenic origins in ascending orders. The first two, called the lower member, constitute the upper part of the "Horokanai ophiolite" (ASAHINA & KOMATSU, 1979; ISHIZUKA, 1980). The upper member of Sorachi Group is composed of volcanogenic sandstone and siltstone, tuff and siliceous mudstones, which are green to black in color. Both chert and siliceous mudstone yield well preserved radiolarian remains. On the basis of radiolarians, chert of the lower member of the



Text-fig. 1. Index and Geologic map of studied area (modified after KIMINAMI et al., 1987).

1; Lower Yezo Group, 2-4; Sorachi Group (2: volcanoclastic tuff and green mudstone, 3: chert, 4: greenstone), 5: fault, 6: fold axis.

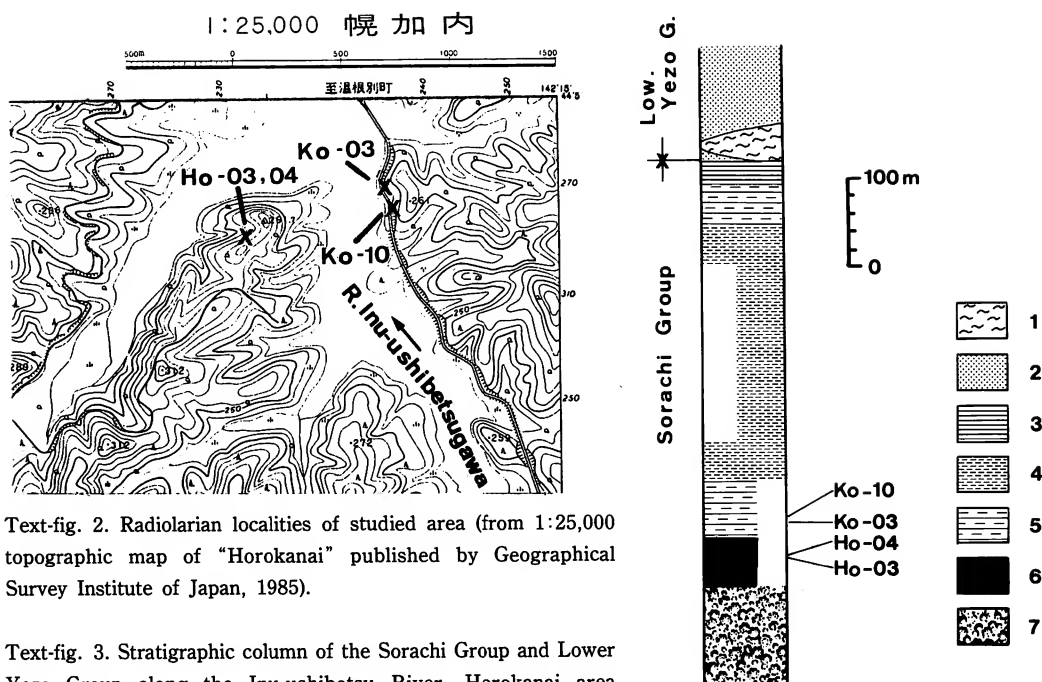
Sorachi Group is assumed to be late Kimmeridgian-early Tithonian in age (KIMINAMI et al., 1987). Lower part of the upper member ranges from latest Tithonian to Berriasian, and possibly even Valanginian in age. Upper part of the upper member is assigned to Hauterivian-Barremian in age.

ISHIZUKA et al. (1983, 1984) also reported the age of the Sorachi Group on the basis of radiolarians as follows; chert is late Jurassic, Tithonian in age and greenish gray shale is early Early Cretaceous, Valanginian in age.

Samples treated here are reddish chert (Ho-03, Ho-04) of the lower member of the Sorachi Group and greenish siliceous mudstone (Ko-03, Ko-10) of the lower part of the upper member. These samples contain many species of radiolarians as shown in Table-1. Stratigraphic horizon of each samples are shown in Text-fig. 3.

Table 1. Radiolarians from the Sorachi Group.
ch: chert, sm: siliceous mudstone.

SAMPLE SPECIES	Ho-03	Ho-04	Ko-03	Ko-10
<i>Arcaeodictyomitra apiara</i>	+	+	+	+
<i>A. minoensis</i>	+		+	+
<i>Cingoloturris carpatica</i>	+	+		
<i>Eucyrtidiellum ptyctum</i>	+	+		
<i>E. pyramis</i>				+
<i>Hsuum</i> sp. cf. <i>H. maxwelli</i>	+			
<i>Mirifusus mediodiratus</i>	+	+	+	+
<i>Parvicingula cosmoconica</i>				+
<i>P. mashitaensis</i>	+	+		
<i>Pseudodictyomitra carpatica</i>	+	+	+	+
<i>P. primitiva</i>	+	+		
<i>Ristola altissima</i>	+			
<i>R. boesii</i>			+	+
<i>R. hsui</i>	+	+		
<i>Sethocapsa horokanaiensis</i>	+	+	+	+
<i>S. trachyostraca</i>			+	+
<i>Acaeniotyle diaphorogona</i>	+	+	+	+
<i>Emiluvia hopsoni</i>	+	+	+	
<i>E. orea</i>			+	+
<i>Sphaerostylus lanceolla</i>			+	+
<i>Vallupus hopsoni</i>			+	+
<i>V. japonicus</i>			+	+
LITHOLOGY	ch	ch	sm	sm



Text-fig. 2. Radiolarian localities of studied area (from 1:25,000 topographic map of "Horokanai" published by Geographical Survey Institute of Japan, 1985).

Text-fig. 3. Stratigraphic column of the Sorachi Group and Lower Yezo Group along the Inu-ushibetsu River, Horokanai area (modified after KIMINAMI et al., 1985a).

1: slump deposits, 2: sandstone and alternation of sandstone and mudstone, 3: black mudstone, 4: alternation of volcanoclastic tuff and mudstone, 5: green siliceous mudstone, 6: chert, 7: greenstone)

3. Systematic Paleontology

Four species, in which two are new species, are described. The genera are alphabetically arranged in this chapter. Types and figured specimens of the new species are registered and deposited in Osaka Museum of Natural History (OMNH). In the systematic description and explanation of plates, the OMNH MR number is the register number of the specimens of the radiolarian fossils in Osaka Museum of Natural History. The number following the sample number indicates the number of metal stab and position on the stab of metal-coated material for SEM.

Subclass RADIOLARIA MÜLLER, 1858

Superorder POLYCYSTINA EHRENBURG, 1838

Order NASSELLARIDA EHRENBURG, 1875

Family SYRINGOCAPSIDAE FOREMAN, 1973

Genus SETHOCAPSA HAECKEL, 1881

Sethocapsa HAECKEL, 1881, p. 433.

Type species (designated by FOREMAN, 1973):

Sethocapsa cometa (PANTANELLI) in RÜST, 1885.

Sethocapsa horokanaiensis KAWABATA n. sp.

(Plate 1, Figs. 9-12; Plate 3, Fig. 3)

1982. *Sethocapsa* (?) sp., MATSUYAMA et al., pl. 1, fig. 6.

Description: Test drop-shape with four segments, upper three segments forming a large, smooth to stepwise conical part, and last fourth segment large, globose without aperture. Cephalis small, subspherical, smooth, imperforate without apical horn. Thorax and abdomen short, subcylindrical to trapezoidal, thick walled with small pores arranged irregularly. Fourth segment large, spherical to subspherical with small circular pores arranged irregularly and with hexagonal pore frame.

Circumferential sutural pores large at the joint between the last two segments. In some specimens, small nodes visible at vertices of pore frame.

Measurements (in microns; based on 14 specimens) :

Overall height	Height of the last segment	Maximum width	
165	83	94	Holotype (OMNH MR 0005)
167	96	108	Maximum
133	71	80	Minimum
158	83	94	Average

Remarks: *S. horokanaiensis* n. sp. differs from other species of *Sethocapsa* by having relatively smaller post abdominal segment and relatively larger first three segments. In other species of *Sethocapsa*, post abdominal segment increases rapidly in width and height, but that of *S. horokanaiensis* increases gradually in size from third to fourth segment. *Sethocapsa horokanaiensis* n. sp. is similar to *Sethocapsa* (?) *subcrassitestata* AITA, but is distinguished from the latter, in having larger conical part and smooth surface, the latter has numerous small nodes at the surface overall of the shell.

Etymology: This species is named after Horokanai Town, Hokkaido, Japan.

Type specimens: Holotype, OMNH MR 0005 (Pl. 1, Fig. 9), Paratype, OMNH MR 0006 (Pl. 1, Fig. 10) and OMNH MR 0008 (Pl. 1, Fig. 12, Pl. 3, Fig. 3).

Occurrence: *S. horokanaiensis* n. sp. commonly occurs in reddish chert and greenish siliceous mudstone of the Sorachi Group in Horokanai area, together with *Hsuum* sp. cf. *H. maxwelli* PESSAGNO, *Parvicingula mashitaensis* MIZUTANI, *Eucyrtidiellum ptyctum* (RIEDEL & SANFILIPPO), *Pseudodictyomitra primitiva* MATSUOKA & YAO, *P. carpatica* (LOZNYAK) and a new species of *Vallupus*. Judging from these co-occurred species, *Sethocapsa horokanaiensis* n. sp. ranges from the *Tricolocapsa yaoi* Assemblage Zone to the *Pseudodictyomitra primitiva*-*Pseudodictyomitra* sp. A Assemblage Zone of MATSUOKA (1986) and MATSUOKA & YAO (1985), and from Biochronozones C1 to lower part of D (Unitary association 9-11) of BAUMGARTNER (1984, 1987). *Sethocapsa horokanaiensis* also ranges from the *Sethocapsa cetia* Interval zone to the *Ditrabs sansalvadrensis* Interval zone of AITA (1987) and AITA & OKADA (1986) and from upper part of the Zone 3 to the Zone 4 of PESSAGNO et al. (1984). Range of this new species is estimated to Kimmeridgian to early Berriasian age.

Order SPUMELLARIDA EHRENBERG , 1875
 Superfamily LIOSPHARACEA HAECKEL , 1881
 Subsuperfamily LIOSPHERILAE HAECKEL , 1881
 Family PANTANELLIDAE PESSAGNO , 1977
 Genus VALLUPUS PESSAGNO and BLOME , 1984

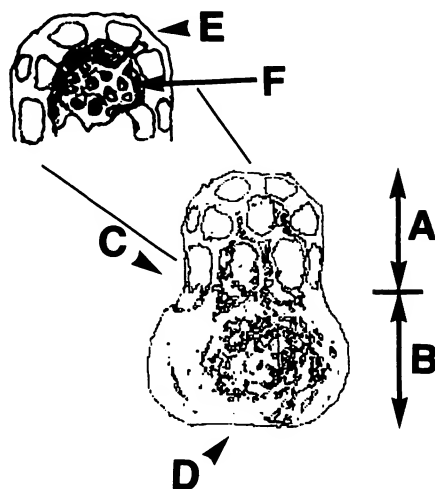
Vallupus PESSAGNO & BLOME in PESSAGNO et al., 1984, p. 22-23.

Type species: *Vallupus hopsoni* PESSAGNO & BLOME ; in PESSAGNO et al., 1984, p. 23; Pl. 1, figs. 14-16, 18, 19, 21; Pl. 5, fig. 1.

Vallupus japonicus KAWABATA n. sp.

(Plate 1, Figs. 1-4; Plate 3, Figs. 1 and 2)

Description: Test small with snowman-like shape consist of two part. Upper shell with thick walled cortical shell (see Text-fig. 4, in terminology) and thin walled first medullary shell. Cortical shell with massive pentagonal and/or hexagonal pore frame; pore frame tending to become elongate at junction with lower shell. Lower shell imperforate, smooth surface, thick walled, spindle to hemispherical shaped shell. Lower shell with a large circular aperture at its terminal. Bars of pore frame of Z direction are three to four times thicker than Y (designations see PESSAGNO & BLOME , 1980, p. 241, Text-fig. 5). Three pore frames visible along AA', while four to five pore frame also visible along BB'.



Text-fig. 4. Descriptive terminology of genus *Vallupus*.

A: Upper shell, B: Lower shell (collar of PESSAGNO & BLOME , 1984), C: Junction between upper shell and lower shell, D: Aperture, E: Cortical shell, F: medullary shell.

Measurements (in microns; based on 11 specimens) :

Overall height	Maximum width	Diameter of cortical shell	
133	94	67	Holotype (OMNH MR 0001)
171	114	82	Maximum
123	83	61	Minimum
140	97	69	Average

Remarks: *Vallupus japonicus* n. sp. differs from *V. hopsoni* PESSAGNO & BLOME by having a large, spindle to hemispherical shaped lower shell which is somewhat constricted at its terminal. *V. hopsoni* PESSAGNO & BLOME has only a small lower shell like a "collar".

Etymology: This species is named from the Latin adjective japonicus, meaning Japanese.

Type specimens: Holotype, OMNH MR 0001 (Pl. 1, Fig. 1); Paratype, OMNH MR 0002 (Pl. 1, Fig. 2) and OMNH MR 0003 (Pl. 1., Fig. 3; Pl. 3, Fig. 1)

Occurrence: This species commonly occurs in greenish siliceous mudstone of the lower part of the upper member of the Sorachi Group in Horokanai area, usually associated with *Emiluvia orea* BAUMGARTNER, *Sphaerostylus lanceola* (PARONA), *Archaeodictyomitra apiara* (RÜST), *Eucyrtidiellum pyramis* (AITA), *Mirifusus mediodiratus* (RÜST), *Ristola boesii* (PARONA), *Sethocapsa trachyostraca* FOREMAN, *S. horokanaiensis* KAWABATA, and *Pseudodictyomitra carpatica* (LOZNYAK). *V. japonicus* does not co-occur with *Hsuum* sp. cf. *H. maxwelli* PESSAGNO, *Parvicingula mashitaensis* MIZUTANI and *Eucyrtidiellum ptyctum* (RIEDEL & SANFILIPPO). According to these faunal association, *Vallupus japonicus* occurs in, the boundary level of the Biochronozones C2 and D of BAUMGARTNER (1984, 1987), lower part of the *Ditrabs sansalvadrensis* Interval zone of AITA (1987) and AITA & OKADA (1986) and upper part of the Zone 4 of PESSAGNO et al. (1984). Range of *Vallupus japonicus* is assumed to late Tithonian to early Berriasian in age.

Vallupus sp. cf. *V. hopsoni* PESSAGNO and BLOME
(Plate 1, Fig. 8)

Remarks: Illustrated specimen has wider lower shell (collar of PESSAGNO & BLOME, in PESSAGNO et al. 1984; see Text-fig. 4) than type specimen of *Vallupus hopsoni* PESSAGNO & BLOME (PESSAGNO et al., 1984, pl. 1, fig. 21).

Vallupus (?) sp. A
(Plate 1, Fig. 7)

Remarks: This species has one primary spine (polar spine) at one side of upper shell (cortical shell), and lower shell (cylindrical collar) on the other side. Pore frame of cortical shell is finer than those of *V. hopsoni* and *V. japonicus*. This maybe an intermediate form between the species of *Pantanellium* PESSAGNO and that of *Vallupus* PESSAGNO & BLOME.

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Plate 1

All figures are scanning electron micrographs. All figures X187, except for fig. 6 X250 and fig. 8b X500.

Figs. 1-4. *Vallupus japonicus* KAWABATA, n. sp.

1. OMNH MR 0001 (Holotype), 31-1-47, Ko-10.
la; lateral view, lb; obliquely basal view, lc; obliquely "apical" view.
2. OMNH MR 0002 (Paratype), 31-2-25, Ko-10.
3. OMNH MR 0003 (Paratype), 44-1-16, Ko-10.
4. OMNH MR 0004, 46-1-22, Ko-10.

Figs. 5-6. *Vallupus hopsoni* PESSAGNO & BLOME

5. OMNH MR 0029, 44-1-33, Ko-10.
6. OMNH MR 0012, 44-2-96, Ko-10.

Fig. 7. *Vallupus* (?) sp. A.

OMNH MR 0009, 31-1-43, Ko-10.

Fig. 8. *Vallupus* sp. cf. *V. hopsoni* PESSAGNO & BLOME

OMNH MR 0010, 31-1-10, Ko-10.

8b. closer view of cortical shell and first medullary shell.

Figs. 9-12. *Sethocapsa horokanaiensis* KAWABATA n. sp.

9. OMNH MR 0005 (Holotype), 45-2-22, Ho-03.
10. OMNH MR 0006 (Paratype), 31-1-29, Ko-03.
11. OMNH MR 0007, 45-2-20, Ho-03.
12. OMNH MR 0008 (Paratype), 44-1-25, Ko-10.

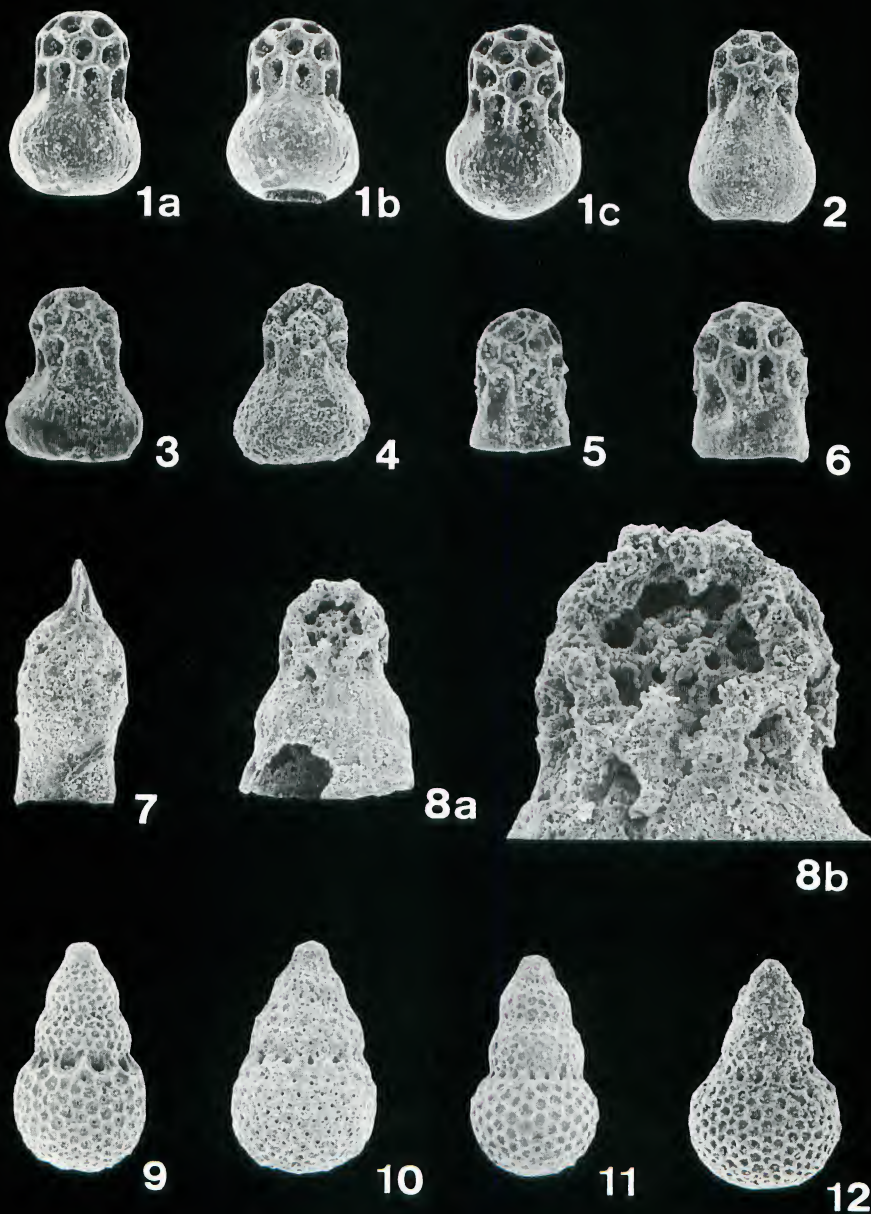


Plate 2

All figures are scanning electron micrographs.

- Fig. 1. *Ristola hsui* PESSAGNO
OMNH MR 0013, 32-2-96, Ho-03, X187.
- Fig. 2-3. *Ristola altissima* (RÜST)
2. OMNH MR 0014, 32-1-69, Ho-03, X125.
3. OMNH MR 0015, 32-2-106, Ho-03, X62.
- Fig. 4. *Parvicingula* sp. cf. *P. cosmoconica* (FOREMAN)
OMNH MR 0016, 31-1-67, Ko-10, X187.
- Fig. 5. *Parvicingula mashitaensis* MIZUTANI
OMNH MR 0017, 32-1-35, Ho-03, X125.
- Fig. 6. *Hsuum* sp. cf. *H. maxwelli* PESSAGNO
OMNH MR 0018, 32-1-26, Ho-03, X187.
- Fig. 7. *Pseudodictyomitra carpatica* (LOZNYAK)
OMNH MR 0019, 46-2-53, Ko-10, X187.
- Fig. 8. *Pseudodictyomitra primitiva* MATSUOKA & YAO
OMNH MR 0020, 45-1-18, Ho-03, X187.
- Fig. 9. *Archaeodictyomitra apiara* (RÜST)
OMNH MR 0021, 32-1-53, Ho-03, X187.
- Fig. 10. *Cinguloturris carpatica* DUMITRICA
OMNH MR 0022, 32-1-59, Ho-03, X187.
- Fig. 11. *Sethocapsa trachyostraca* FOREMAN
OMNH MR 0023, 46-2-77, Ko-10, X187.
- Fig. 12. *Eucyrtidiellum ptyctum* (RIEDEL & SANFILIPPO)
OMNH MR 0024, 45-1-46, Ho-03, X187.
- Fig. 13. *Eucyrtidiellum pyramis* (AITA)
OMNH MR 0025, 44-2-97, Ko-10, X250.
- Fig. 14. *Emiluvia oreia* BAUMGARTNER
OMNH MR 0026, 44-2-129, Ko-10, X187.
- Fig. 15. *Acaeniotyle diaphorogona* FOREMAN
OMNH MR 0027, 44-2-95, Ko-10, X187.
- Fig. 16. *Sphaerostylus lanceola* (PAROMA)
OMNH MR 0028, 44-2-87, Ko-10, X125.

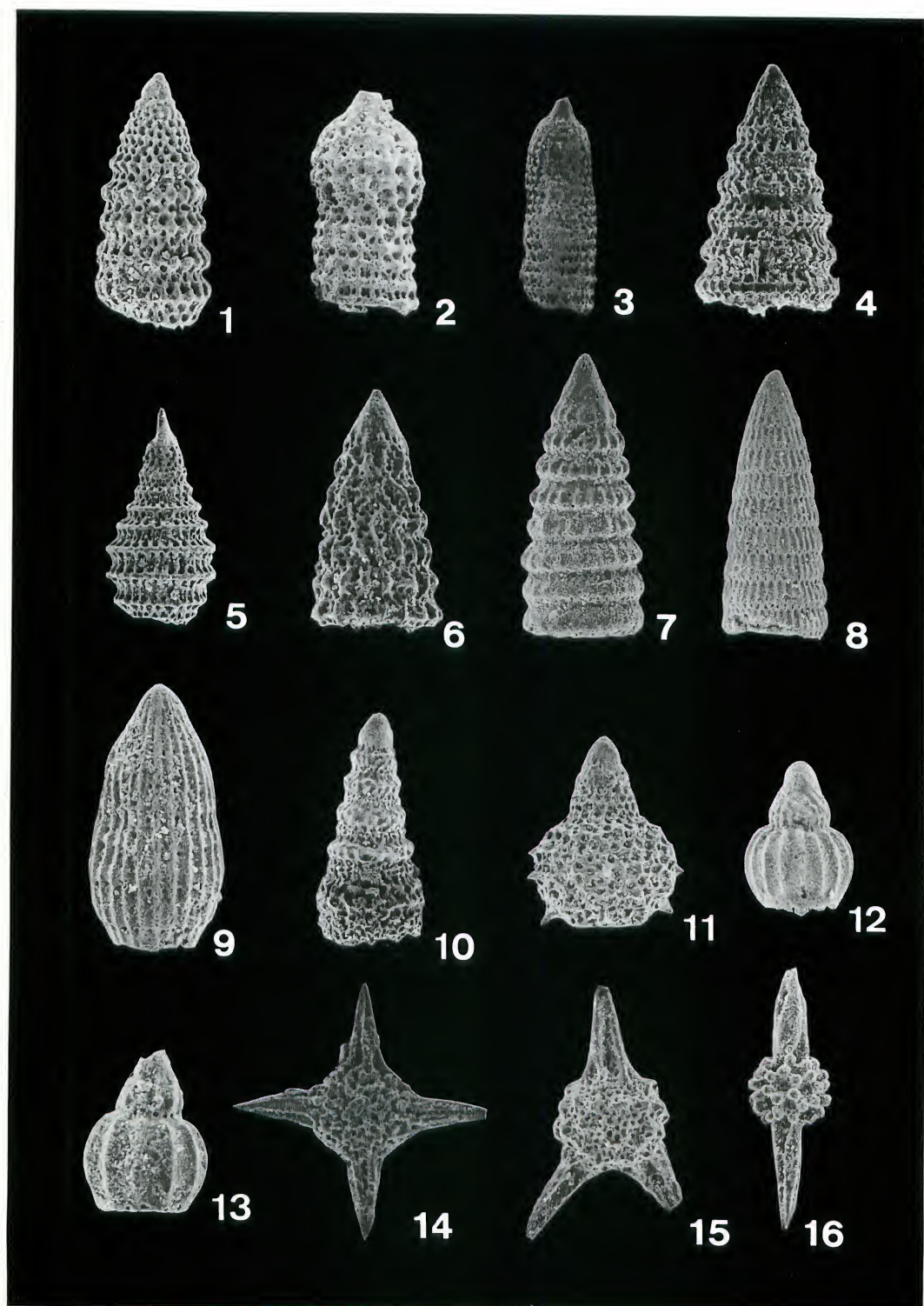


Plate 3

All figures are transmitted light micrographs.

All figures are X320.

Figs. 1-2. *Vallupus japonicus* KAWABATA n. sp.

1a-1c. OMNH MR 0003 (Paratype), 44-1-16, Ko-10.

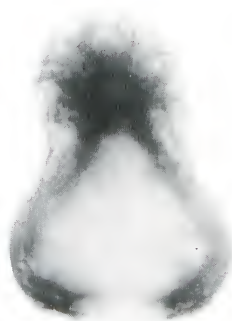
2a-2c. OMNH MR 0011, 44-1-17, Ko-10.

Fig. 3. *Sethocapsa horokanaiensis* KAWABATA n. sp.

OMNH MR 0008 (Paratype), 44-1-25, Ko-10.



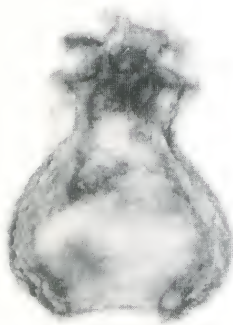
1a



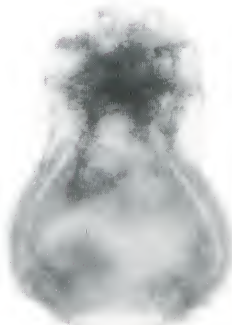
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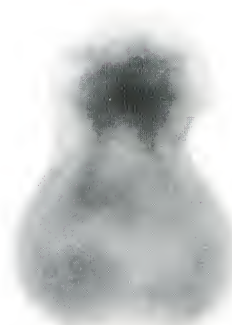
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2a



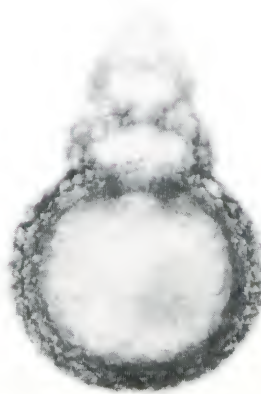
2b



2c



3a



3b



3c